

JAP20 Rec'd PCT/PTO 21 JUL 2006

## SEQUENCE LISTING

<110> The Trustees of the University of Pennsylvania  
 Stedman, Hansell  
 Su, Leonard  
 Mitchell, Marilyn

<120> Microutrophin and uses Thereof

<130> UPN-Q3355PCT

<150> US 60/538,877  
 <151> 2004-01-23

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<170> PatentIn version 3.3

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<213> Artificial

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Gly Lys Pro Pro Ile Asn Asp Met Phe Thr Asp Leu Lys Asp Gly Arg  
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Lys Leu Leu Asp Leu Leu Glu Gly Leu Thr Gly Thr Ser Leu Pro Lys  
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Glu Arg Gly Ser Thr Arg Val His Ala Leu Asn Asn Val Asn Arg Val  
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Leu Gln Val Leu His Gln Asn Asn Val Asp Leu Val Asn Ile Gly Gly  
 100 105 110

Thr Asp Ile Val Asp Gly Asn His Lys Leu Thr Leu Gly Leu Leu Trp  
 115 120 125

Ser Ile Ile Leu His Trp Gln Val Lys Asp Val Met Lys Asp Val Met  
 130 135 140

Ser Asp Leu Gln Gln Thr Asn Ser Glu Lys Ile Leu Leu Ser Trp Val  
 145 150 155 160

Arg Gln Ser Thr Arg Pro Tyr Ser Gln Val Asn Val Leu Asn Phe Thr  
165 170 175

Thr Ser Trp Thr Asp Gly Leu Ala Phe Asn Ala Val Leu His Arg His  
180 185 190

Lys Pro Asp Leu Phe Ser Trp Asp Arg Val Val Lys Met Ser Pro Ile  
195 200 205

Glu Arg Leu Glu His Ala Phe Ser Lys Ala Gln Thr Tyr Leu Gly Ile  
210 215 220

Glu Lys Leu Leu Asp Pro Glu Asp Val Ala Val Gln Leu Pro Asp Lys  
225 230 235 240

Lys Ser Ile Ile Met Tyr Leu Thr Ser Leu Phe Glu Val Leu Pro Gln  
245 250 255

Gln Val Thr Leu Asp Ala Ile Arg Glu Val Glu Thr Leu Pro Arg Lys  
260 265 270

Tyr Lys Lys Glu Cys Glu Glu Gly Glu Ile Ser Ile Gln Ser Ser Ala  
275 280 285

Pro Glu Glu Glu His Glu Cys Pro Gly Ala Glu Thr Pro Ser Thr Val  
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Thr Glu Val Asp Thr Asp Leu Asp Ser Tyr Gln Ile Ala Leu Glu Glu  
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Val Leu Thr Trp Leu Leu Ser Ala Glu Asp Thr Phe Gln Glu Gln Asp  
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Asp Ile Ser Asp Asp Val Glu Glu Val Lys Glu Gln Phe Thr Thr His  
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355 360 365

Val Leu Gln Ala Gly Asn Gln Leu Ile Thr Gln Gly Thr Leu Ser Asp  
370 375 380

Glu Glu Glu Phe Glu Ile Gln Glu Gln Met Thr Leu Leu Asn Ala Arg  
385 390 395 400

Trp Glu Ala Leu Arg Val Asp Ser Met Asn Arg Gln Ser Arg Leu His  
405 410 415

Asp Val Leu Met Glu Leu Gln Lys 420 425 Gln Leu Gln Gln Leu Ser Ala 430

Trp Leu Thr Leu Thr Glu Glu Arg Ile Gln Lys Met Glu Thr Cys Pro 435 440 445

Leu Asp Asp Asp Leu Lys Ser Leu Gln Lys Leu Leu Glu Asp His Lys 450 455 460

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Thr His Met Val Val Ile Val Asp Glu Asn Ser Gly Glu Ser Ala Thr 485 490 495

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Val Cys Arg Trp Thr Glu Glu Arg Trp Ser Arg Leu Gln Glu Ile Asn 515 520 525

Ile Leu Trp Gln Glu Leu Leu Glu Glu Gln Cys Leu Leu Lys Ala Trp 530 535 540

Leu Thr Glu Lys Glu Glu Ala Leu Asn Lys Val Gln Thr Ser Asn Phe 545 550 555 560

Lys Asp Gln Lys Glu Leu Ser Val Ser Ile Arg Arg Leu Ala Ile Leu 565 570 575

Lys Glu Asp Met Glu Met Lys Arg Gln Ala Leu Asp Gln Leu Ser Glu 580 585 590

Ile Gly Gln Asp Val Gly Gln Leu Val Asp Asn Pro Lys Ala Ser Lys 595 600 605

Lys Ile Asn Ser Asp Ser Glu Glu Leu Thr Gln Arg Trp Asp Ser Leu 610 615 620

Val Gln Arg Leu Glu Asp Ser Ser Asn Gln Val Thr Gln Ala Val Ala 625 630 635 640

Lys Leu Gly Met Ser Gln Ile Pro Gln Lys Asp Leu Leu Glu Thr Val 645 650 655

Arg Ile Arg Glu Gln Val Thr Thr Lys Arg Ser Lys Gln Glu Leu Pro 660 665 670

Pro Pro Pro Pro Lys Lys Arg Gln Ile Pro Val Asp Leu Glu Lys

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Ile Asp Ser Leu Gln Asp His Ile Glu Lys Thr Met Ala Phe Arg Glu		
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Glu Ile Ala Pro Ile Asn Leu Lys Val Lys Thr Val Asn Asp Leu Ser		
740	745	750
Ser Gln Leu Ser Pro Leu Asp Leu His Pro Ser Leu Lys Met Ser Arg		
755	760	765
Gln Leu Asp Asp Leu Asn Met Arg Trp Lys Leu Leu Gln Val Ser Val		
770	775	780
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785	790	795
Ser Ser Gln His Phe Leu Ser Thr Ser Val Gln Leu Pro Trp Gln Arg.		
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Ser Ile Ser His Asn Lys Val Pro Tyr Tyr Ile Asn His Gln Thr Gln		
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Thr Thr Cys Trp Asp Arg Pro Lys Met Thr Glu Leu Phe Gln Ser Leu		
835	840	845
Ala Asp Leu Asn Asn Val Arg Phe Ser Ala Tyr Arg Thr Ala Ile Lys		
850	855	860
Ile Arg Arg Leu Gln Lys Ala Leu Cys Leu Asp Leu Leu Glu Leu Asn		
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Thr Thr Asn Glu Val Phe Lys Gln His Lys Leu Asn Gln Asn Asp Gln		
885	890	895
Leu Leu Ser Val Pro Asp Val Ile Asn Cys Leu Thr Thr Tyr Asp		
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Gly Leu Glu Gln Met His Lys Asp Leu Val Asn Val Pro Leu Cys Val		
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Asp Met Cys Leu Asn Trp Leu Leu Asn Val Tyr Asp Thr Gly Arg Thr		
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Gly Lys Ile Arg Val Gln Ser Leu Lys Ile Gly Leu Met Ser Leu Ser  
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Lys Gly Leu Leu Glu Glu Lys Tyr Arg Tyr Leu Phe Lys Glu Val Ala  
965 970 975

Gly Pro Thr Glu Met Cys Asp Gln Arg Gln Leu Gly Leu Leu His  
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Asp Ala Ile Gln Ile Pro Arg Gln Leu Gly Glu Val Ala Ala Phe Gly  
995 1000 1005

Gly Ser Asn Ile Glu Pro Ser Val Arg Ser Cys Phe Gln Gln Asn  
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Asn Asn Lys Pro Glu Ile Ser Val Lys Asp Phe Ile Asp Trp Met  
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Arg Leu Glu Pro Gln Ser Met Val Trp Leu Pro Val Leu His Arg  
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Val Ala Ala Ala Glu Thr Ala Lys His Gln Ala Lys Cys Asn Ile  
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Cys Lys Glu Cys Pro Ile Val Gly Phe Arg Tyr Arg Ser Leu Lys  
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His Phe Asn Tyr Asp Val Cys Gln Ser Cys Phe Phe Ser Gly Arg  
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Thr Ala Lys Gly His Lys Leu His Tyr Pro Met Val Glu Tyr Cys  
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Ile Pro Thr Thr Ser Gly Glu Asp Val Arg Asp Phe Thr Lys Val  
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Leu Lys Asn Lys Phe Arg Ser Lys Lys Tyr Phe Ala Lys His Pro  
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35 40 45

Asp Ile Gln Ala Glu Ile Asp Ala His Asn Asp Ile Phe Lys Ser Ile  
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Asp Gly Asn Arg Gln Lys Met Val Lys Ala Leu Gly Asn Ser Glu Glu  
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Ala Thr Met Leu Gln His Arg Leu Asp Asp Met Asn Gln Arg Trp Asn  
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Asp Leu Lys Ala Lys Ser Ala Ser Ile Arg Ala His Leu Glu Ala Ser  
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Ala Glu Lys Trp Asn Arg Leu Leu Met Ser Leu Glu Glu Leu Ile Lys  
115 120 125

Trp Leu Asn Met Lys Asp Glu Glu Leu Lys Lys Gln Met Pro Ile Gly  
130 135 140

Gly Asp Val Pro Ala Leu Gln Leu Gln Tyr Asp His Cys Lys Ala Leu  
145 150 155 160

Arg Arg Glu Leu Lys Glu Lys Glu Tyr Ser Val Leu Asn Ala Val Asp  
165 170 175

Gln Ala Arg Val Phe Leu Ala Asp Gln Pro Ile Glu Ala Pro Glu Glu  
180 185 190

Pro Arg Arg Asn Leu Gln Ser Lys Thr Glu Leu Thr Pro Glu Glu Arg  
195 200 205

Ala Gln Lys Ile Ala Lys Ala Met Arg Lys Gln Ser Ser Glu Val Lys  
210 215 220

Glu Lys Trp Glu Ser Leu Asn Ala Val Thr Ser Asn Trp Gln Lys Gln  
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Val Asp Lys Ala Leu Glu Lys Leu Arg Asp Leu Gln Gly Ala Met Asp  
Page 8

245

250

255

Asp Leu Asp Ala Asp Met Lys Glu Ala Glu Ser Val Arg Asn Gly Trp  
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Lys Pro Val Gly Asp Leu Leu Ile Asp Ser Leu Gln Asp His Ile Glu  
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Lys Thr Val Asn Asp Leu Ser Ser Gln Leu Ser Pro Leu Asp Leu His  
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Pro Ser Leu Lys Met Ser Arg Gln Leu Asp Asp Leu Asn Met Arg Trp  
325 330 335

Lys Leu Leu Gln Val Ser Val Asp Asp Arg Leu Lys Gln Leu Gln Glu  
340 345 350

Ala His Arg Asp Phe Gly Pro Ser Ser Gln His Phe Leu Ser Thr Ser  
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Val Gln Leu Pro Trp Gln Arg Ser Ile Ser His Asn Lys Val Pro Tyr  
370 375 380

Tyr Ile Asn His Gln Thr Gln Thr Cys Trp Asp His Pro Lys Met  
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Thr Glu Leu Phe Gln Ser Leu Ala Asp Leu Asn Asn Val Arg Phe Ser  
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Val Tyr Asp Thr Gly Arg Thr Gly Lys Ile Arg Val Gln Ser Leu Lys  
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Tyr Leu Phe Lys Glu Val Ala Gly Pro Thr Glu Met Cys Asp Gln Arg  
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580 585 590

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Val Leu His Arg Val Ala Ala Ala Glu Thr Ala Lys His Gln Ala Lys  
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Cys Asn Ile Cys Lys Glu Cys Pro Ile Val Gly Phe Arg Tyr Arg Ser  
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Leu Lys His Phe Asn Tyr Asp Val Cys Gln Ser Cys Phe Phe Ser Gly  
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Arg Thr Ala Lys Gly His Lys Leu His Tyr Pro Met Val Glu Tyr Cys  
660 665 670

Ile Pro Thr Thr Ser Gly Glu Asp Val Arg Asp Phe Thr Lys Val Leu  
675 680 685

Lys Asn Lys Phe Arg Ser Lys Lys Tyr Phe Ala Lys His Pro Arg Leu  
690 695 700

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Pro Ile Thr Leu Ile Ser Met Trp Pro Glu His Tyr Asp Pro Ser Gln  
725 730 735

Ser Pro Gln Leu Phe His Asp Asp Thr His Ser Arg Ile Glu Gln Tyr  
740 745 750

Ala Thr Arg Leu Ala Gln Met Glu Arg Thr Asn Gly Ser Phe Leu Thr  
755 760 765

Asp Ser Ser Ser Thr Thr Gly Ser Val Glu Asp Glu His Ala Leu Ile  
770 775 780

Gln Gln Tyr Cys Gln Thr Leu Gly Gly Glu Ser Pro Val Ser Gln Pro  
785 790 795 800

Gln Ser Pro Ala Gln Ile Leu Lys Ser Val Glu Arg Glu Glu Arg Gly  
805 810 815

Glu Leu Glu Arg Ile Ile Ala Asp Leu Glu Glu Glu Gln Arg Asn Leu  
820 825 830

Gln Val Glu Tyr Glu Gln Leu Lys Asp Gln His Leu Arg Arg Gly Leu  
835 840 845

Pro Val Gly Ser Pro Pro Glu Ser Ile Ile Ser Pro His His Thr Ser  
850 855 860

Glu Asp Ser Glu Leu Ile Ala Glu Ala Lys Leu Leu Arg Gln His Lys  
865 870 875 880

Gly Arg Leu Glu Ala Arg Met Gln Ile Leu Glu Asp His Asn Lys Gln  
885 890 895

Leu Glu Ser Gln Leu His Arg Leu Arg Gln Leu Leu Glu Gln Pro Glu  
900 905 910

Ser Asp Ser Arg Ile Asn Gly Val Ser Pro Trp Ala Ser Pro Gln His  
915 920 925

Ser Ala Leu Ser Tyr Ser Leu Asp Pro Asp Ala Ser Gly Pro Gln Phe  
930 935 940

His Gln Ala Ala Gly Glu Asp Leu Leu Ala Pro Pro His Asp Thr Ser  
945 950 955 960

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Gly Lys Pro Pro Ile Asn Asp Met Phe Thr Asp Leu Lys Asp Gly Arg  
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Lys Leu Leu Asp Leu Leu Glu Gly Leu Thr Gly Thr Ser Leu Pro Lys  
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Glu Arg Gly Ser Thr Arg Val His Ala Leu Asn Asn Val Asn Arg Val  
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Leu Gln Val Leu His Gln Asn Asn Val Glu Leu Val Asn Ile Gly Gly  
100 105 110

Thr Asp Ile Val Asp Gly Asn His Lys Leu Thr Leu Gly Leu Leu Trp  
115 120 125

Ser Ile Ile Leu His Trp Gln Val Lys Asp Val Met Lys Asp Val Met  
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Ser Asp Leu Gln Gln Thr Asn Ser Glu Lys Ile Leu Leu Ser Trp Val  
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Arg Gln Thr Thr Arg Pro Tyr Ser Gln Val Asn Val Leu Asn Phe Thr  
165 170 175

Thr Ser Trp Thr Asp Gly Leu Ala Phe Asn Ala Val Leu His Arg His  
180 185 190

Lys Pro Asp Leu Phe Ser Trp Asp Lys Val Val Lys Met Ser Pro Ile  
195 200 205

Glu Arg Leu Glu His Ala Phe Ser Lys Ala Gln Thr Tyr Leu Gly Ile  
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Glu Lys Leu Leu Asp Pro Glu Asp Val Ala Val Arg Leu Pro Asp Lys  
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Lys Ser Ile Ile Met Tyr Leu Thr Ser Leu Phe Glu Val Leu Pro Gln  
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Gln Val Thr Ile Asp Ala Ile Arg Glu Val Glu Thr Leu Pro Arg Lys  
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Tyr Lys Lys Glu Cys Glu Glu Ala Ile Asn Ile Gln Ser Thr Ala  
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Pro Glu Glu Glu His Glu Ser Pro Arg Ala Glu Thr Pro Ser Thr Val  
290 295 300

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Val Leu Thr Trp Leu Leu Ser Ala Glu Asp Thr Phe Gln Glu Gln Asp  
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Asp Ile Ser Asp Asp Val Glu Glu Val Lys Asp Gln Phe Ala Thr His  
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Trp Glu Ala Leu Arg Val Glu Ser Met Asp Arg Gln Ser Arg Leu His  
405 410 415

Asp Val Leu Met Glu Leu Gln Lys Lys Gln Leu Gln Gln Leu Ser Ala  
420 425 430

Trp Leu Thr Leu Thr Glu Glu Arg Ile Gln Lys Met Glu Thr Cys Pro  
435 440 445

Leu Asp Asp Asp Val Lys Ser Leu Gln Lys Leu Leu Glu Glu His Lys  
450 455 460

Ser Leu Gln Ser Asp Leu Glu Ala Glu Gln Val Lys Val Asn Ser Leu  
465 470 475 480

Thr His Met Val Val Ile Val Asp Glu Asn Ser Gly Glu Ser Ala Thr  
485 490 495

Ala Ile Leu Glu Asp Gln Leu Gln Lys Leu Gly Glu Arg Trp Thr Ala  
500 505 510

Val Cys Arg Trp Thr Glu Glu Arg Trp Asn Arg Leu Gln Glu Ile Asn  
515 520 525

Ile Leu Trp Gln Glu Leu Leu Glu Glu Gln Cys Leu Leu Lys Ala Trp  
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Lys Glu Asp Met Glu Met Lys Arg Gln Thr Leu Asp Gln Leu Ser Glu  
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Ile Gly Gln Asp Val Gly Gln Leu Leu Asp Asn Ser Lys Ala Ser Lys  
595 600 605

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675 680 685

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705 710 715 720

Ile Asp Ser Leu Gln Asp His Ile Glu Lys Ile Met Ala Phe Arg Glu  
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Glu Ile Ala Pro Ile Asn Phe Lys Val Lys Thr Val Asn Asp Leu Ser  
740 745 750

Ser Gln Leu Ser Pro Leu Asp Leu His Pro Ser Leu Lys Met Ser Arg  
755 760 765

Gln Leu Asp Asp Leu Asn Met Arg Trp Lys Leu Leu Gln Val Ser Val

770                    775                    780

Asp Asp Arg Leu Lys Gln Leu Gln Glu Ala His Arg Asp Phe Gly Pro  
785                    790                    795                    800

Ser Ser Gln His Phe Leu Ser Thr Ser Val Gln Leu Pro Trp Gln Arg  
805                    810                    815

Ser Ile Ser His Asn Lys Val Pro Tyr Tyr Ile Asn His Gln Thr Gln  
820                    825                    830

Thr Thr Cys Trp Asp His Pro Lys Met Thr Glu Leu Phe Gln Ser Leu  
835                    840                    845

Ala Asp Leu Asn Asn Val Arg Phe Ser Ala Tyr Arg Thr Ala Ile Lys  
850                    855                    860

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865                    870                    875                    880

Thr Thr Asn Glu Ile Phe Lys Gln His Lys Leu Asn Gln Asn Asp Gln  
885                    890                    895

Leu Leu Ser Val Pro Asp Val Ile Asn Cys Leu Thr Thr Tyr Asp  
900                    905                    910

Gly Leu Glu Gln Met His Lys Asp Leu Val Asn Val Pro Leu Cys Val  
915                    920                    925

Asp Met Cys Leu Asn Trp Leu Leu Asn Val Tyr Asp Thr Gly Arg Thr  
930                    935                    940

Gly Lys Ile Arg Val Gln Ser Leu Lys Ile Gly Leu Met Ser Leu Ser  
945                    950                    955                    960

Lys Gly Leu Leu Glu Glu Lys Tyr Arg Tyr Leu Phe Lys Glu Val Ala  
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Gly Pro Thr Glu Met Cys Asp Gln Arg Gln Leu Gly Leu Leu Leu His  
980                    985                    990

Asp Ala Ile Gln Ile Pro Arg Gln Leu Gly Glu Val Ala Ala Phe Gly  
995                    1000                    1005

Gly Ser Asn Ile Glu Pro Ser Val Arg Ser Cys Phe Gln Gln Asn  
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Asn Asn Lys Pro Glu Ile Ser Val Lys Glu Phe Ile Asp Trp Met  
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His Leu Glu Pro Gln Ser Met Val Trp Leu Pro Val Leu His Arg  
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Val Ala Ala Ala Glu Thr Ala Lys His Gln Ala Lys Cys Asn Ile  
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Cys Lys Glu Cys Pro Ile Val Gly Phe Arg Tyr Arg Ser Leu Lys  
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His Phe Asn Tyr Asp Val Cys Gln Ser Cys Phe Phe Ser Gly Arg  
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Thr Ala Lys Gly His Lys Leu His Tyr Pro Met Val Glu Tyr Cys  
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Ile Pro Thr Thr Ser Gly Glu Asp Val Arg Asp Phe Thr Lys Val  
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Leu Lys Asn Lys Phe Arg Ser Lys Lys Tyr Phe Ala Lys His Pro  
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Leu Glu Thr Asn  
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Gly Lys Pro Pro Ile Ser Asp Met Phe Ser Asp Leu Lys Asp Gly Arg  
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Lys Leu Leu Asp Leu Leu Glu Gly Leu Thr Gly Thr Ser Leu Pro Lys

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Glu Arg Gly Ser Thr Arg Val His Ala Leu Asn Asn Val Asn Arg Val			
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Leu Gln Val Leu His Gln Asn Asn Val Asp Leu Val Asn Ile Gly Gly			
100		105	110
Thr Asp Ile Val Ala Gly Asn Pro Lys Leu Thr Leu Gly Leu Leu Trp			
115		120	125
Ser Ile Ile Leu His Trp Gln Val Lys Asp Val Met Lys Asp Ile Met			
130		135	140
Ser Asp Leu Gln Gln Thr Asn Ser Glu Lys Ile Leu Leu Ser Trp Val			
145		150	155
Arg Gln Thr Thr Arg Pro Tyr Ser Gln Val Asn Val Leu Asn Phe Thr			
165		170	175
Thr Ser Trp Thr Asp Gly Leu Ala Phe Asn Ala Val Leu His Arg His			
180		185	190
Lys Pro Asp Leu Phe Asp Trp Asp Glu Met Val Lys Met Ser Pro Ile			
195		200	205
Glu Arg Leu Asp His Ala Phe Asp Lys Ala His Thr Ser Leu Gly Ile			
210		215	220
Glu Lys Leu Leu Ser Pro Glu Thr Val Ala Val His Leu Pro Asp Lys			
225		230	235
Lys Ser Ile Ile Met Tyr Leu Thr Ser Leu Phe Glu Val Leu Pro Gln			
245		250	255
Gln Val Thr Ile Asp Ala Ile Arg Glu Val Glu Thr Leu Pro Arg Lys			
260		265	270
Tyr Lys Lys Glu Cys Glu Glu Glu Ile His Ile Gln Ser Ala Val			
275		280	285
Leu Ala Glu Glu Gly Gln Ser Pro Arg Ala Glu Thr Pro Ser Thr Val			
290		295	300
Thr Glu Val Asp Met Asp Leu Asp Ser Tyr Gln Ile Ala Leu Glu Glu			
305		310	315
Val Leu Thr Trp Leu Leu Ser Ala Glu Asp Thr Phe Gln Glu Gln His			
325		330	335

Asp Ile Ser Asp Asp Val Glu Glu Val Lys Glu Gln Phe Ala Thr His  
340 345 350

Glu Thr Phe Met Met Glu Leu Thr Ala His Gln Ser Ser Val Gly Ser  
355 360 365

Val Leu Gln Ala Gly Asn Gln Leu Met Thr Gln Gly Thr Leu Ser Arg  
370 375 380

Glu Glu Glu Phe Glu Ile Gln Glu Gln Met Thr Leu Leu Asn Ala Arg  
385 390 395 400

Trp Glu Ala Leu Arg Val Glu Ser Met Glu Arg Gln Ser Arg Leu His  
405 410 415

Asp Ala Leu Met Glu Leu Gln Lys Lys Gln Leu Gln Gln Leu Ser Ser  
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Trp Leu Ala Leu Thr Glu Glu Arg Ile Gln Lys Met Glu Ser Leu Pro  
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Leu Gly Asp Asp Leu Pro Ser Leu Gln Lys Leu Leu Gln Glu His Lys  
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Ser Leu Gln Asn Asp Leu Glu Ala Glu Gln Val Lys Val Asn Ser Leu  
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Thr His Met Val Val Ile Val Asp Glu Asn Ser Gly Glu Ser Ala Thr  
485 490 495

Ala Leu Leu Glu Asp Gln Leu Gln Lys Leu Gly Glu Arg Trp Thr Ala  
500 505 510

Val Cys Arg Trp Thr Glu Glu Arg Trp Asn Arg Leu Gln Glu Ile Ser  
515 520 525

Ile Leu Trp Gln Glu Leu Leu Glu Glu Gln Cys Leu Leu Glu Ala Trp  
530 535 540

Leu Thr Glu Lys Glu Glu Ala Leu Asp Lys Val Gln Thr Ser Asn Phe  
545 550 555 560

Lys Asp Gln Lys Glu Leu Ser Val Ser Val Arg Arg Leu Ala Ile Leu  
565 570 575

Lys Glu Asp Met Glu Met Lys Arg Gln Thr Leu Asp Gln Leu Ser Glu  
580 585 590

Ile Gly Gln Asp Val Gly Gln Leu Leu Ser Asn Pro Lys Ala Ser Lys  
595 600 605

Lys Met Asn Ser Asp Ser Glu Glu Leu Thr Gln Arg Trp Asp Ser Leu  
610 615 620

Val Gln Arg Leu Glu Asp Ser Ser Asn Gln Val Thr Gln Ala Val Ala  
625 630 635 640

Lys Leu Gly Met Ser Gln Ile Pro Gln Lys Asp Leu Leu Glu Thr Val  
645 650 655

His Val Arg Glu Gln Gly Met Val Lys Lys Pro Lys Gln Glu Leu Pro  
660 665 670

Pro Pro Pro Pro Pro Lys Lys Arg Gln Ile His Val Asp Leu Glu Lys  
675 680 685

Leu Arg Asp Leu Gln Gly Ala Met Asp Asp Leu Asp Ala Asp Met Lys  
690 695 700

Glu Val Glu Ala Val Arg Asn Gly Trp Lys Pro Val Gly Asp Leu Leu  
705 710 715 720

Ile Asp Ser Leu Gln Asp His Ile Glu Lys Thr Leu Ala Phe Arg Glu  
725 730 735

Glu Ile Ala Pro Ile Asn Leu Lys Val Lys Thr Met Asn Asp Leu Ser  
740 745 750

Ser Gln Leu Ser Pro Leu Asp Leu His Pro Ser Leu Lys Met Ser Arg  
755 760 765

Gln Leu Asp Asp Leu Asn Met Arg Trp Lys Leu Leu Gln Val Ser Val  
770 775 780

Asp Asp Arg Leu Lys Gln Leu Gln Glu Ala His Arg Asp Phe Gly Pro  
785 790 795 800

Ser Ser Gln His Phe Leu Ser Thr Ser Val Gln Leu Pro Trp Gln Arg  
805 810 815

Ser Ile Ser His Asn Lys Val Pro Tyr Tyr Ile Asn His Gln Thr Gln  
820 825 830

Thr Thr Cys Trp Asp His Pro Lys Met Thr Glu Leu Phe Gln Ser Leu  
835 840 845

Ala Asp Leu Asn Asn Val Arg Phe Ser Ala Tyr Arg Thr Ala Ile Lys  
850 855 860

Ile Arg Arg Leu Gln Lys Ala Leu Cys Leu Asp Leu Leu Glu Leu Asn  
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Thr Thr Asn Glu Val Phe Lys Gln His Lys Leu Asn Gln Asn Asp Gln  
885 890 895

Leu Leu Ser Val Pro Asp Val Ile Asn Cys Leu Thr Thr Thr Tyr Asp  
900 905 910

Gly Leu Glu Gln Leu His Lys Asp Leu Val Asn Val Pro Leu Cys Val  
915 920 925

Asp Met Cys Leu Asn Trp Leu Leu Asn Val Tyr Asp Thr Gly Arg Thr  
930 935 940

Gly Lys Ile Arg Val Gln Ser Leu Lys Ile Gly Leu Met Ser Leu Ser  
945 950 955 960

Lys Gly Leu Leu Glu Glu Lys Tyr Arg Cys Leu Phe Lys Glu Val Ala  
965 970 975

Gly Pro Thr Glu Met Cys Asp Gln Arg Gln Leu Gly Leu Leu Leu His  
980 985 990

Asp Ala Ile Gln Ile Pro Arg Gln Leu Gly Glu Val Ala Ala Phe Gly  
995 1000 1005

Gly Ser Asn Ile Glu Pro Ser Val Arg Ser Cys Phe Gln Gln Asn  
1010 1015 1020

Asn Asn Lys Pro Glu Ile Ser Val Lys Glu Phe Ile Asp Trp Met  
1025 1030 1035

His Leu Glu Pro Gln Ser Met Val Trp Leu Pro Val Leu His Arg  
1040 1045 1050

Val Ala Ala Ala Glu Thr Ala Lys His Gln Ala Lys Cys Asn Ile  
1055 1060 1065

Cys Lys Glu Cys Pro Ile Val Gly Phe Arg Tyr Arg Ser Leu Lys  
1070 1075 1080

His Phe Asn Tyr Asp Val Cys Gln Ser Cys Phe Phe Ser Gly Arg  
1085 1090 1095

Thr Ala Lys Gly His Lys Leu His Tyr Pro Met Val Glu Tyr Cys

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Ile Pro Thr Thr Ser Gly Glu Asp Val Arg Asp Phe Thr Lys Val		
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Leu Lys Asn Lys Phe Arg Ser Lys Lys Tyr Phe Ala Lys His Pro		
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Arg Leu Leu Asp Leu Leu Glu Gly Leu Thr Gly Gln Lys Leu Pro Lys  
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Glu Lys Gly Ser Thr Arg Val His Ala Leu Asn Asn Val Asn Lys Ala  
 65 70 75 80

Leu Arg Val Leu Asn Asn Asn Val Asp Leu Val Asn Ile Gly Ser Thr  
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Asp Ile Val Asp Gly Asn His Lys Leu Thr Leu Gly Leu Ile Trp Asn  
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Ile Ile Leu His Trp Gln Val Lys Asn Val Met Lys Asn Ile Met Ala  
 115 120 125

Gly Leu Gln Gln Thr Asn Ser Glu Lys Ile Leu Leu Ser Trp Val Arg  
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Gln Ser Thr Arg Asn Tyr Pro Gln Val Asn Val Ile Asn Phe Thr Thr  
 145 150 155 160

Ser Trp Ser Asp Gly Leu Ala Leu Asn Ala Leu Ile His Ser His Arg  
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Pro Asp Leu Phe Asp Trp Asn Ser Val Val Cys Gln Gln Ser Ala Thr  
180 185 190

Gln Arg Leu Glu His Ala Phe Asn Ile Ala Arg Tyr Gln Leu Gly Ile  
195 200 205

Glu Lys Leu Leu Asp Pro Glu Asp Val Asp Thr Thr Tyr Pro Asp Lys  
210 215 220

Lys Ser Ile Leu Met Tyr Ile Thr Ser Leu Phe Gln Val Leu Pro Gln  
225 230 235 240

Gln Val Ser Ile Glu Ala Ile Gln Glu Val Glu Met Leu Pro Arg Pro  
245 250 255

Pro Lys Val Thr Lys Glu Glu His Phe Gln Leu His His Gln Met His  
260 265 270

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275 280 285

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290 295 300

Tyr Val Thr Thr Ser Asp Pro Thr Arg Ser Pro Phe Pro Ser Gln His  
305 310 315 320

Leu Glu Ala Pro Glu Asp Lys Ser Phe Gly Ser Ser Leu Met Glu Ser  
325 330 335

Glu Val Asn Leu Asp Arg Tyr Gln Thr Ala Leu Glu Glu Val Leu Ser  
340 345 350

Trp Leu Leu Ser Ala Glu Asp Thr Leu Gln Ala Gln Gly Glu Ile Ser  
355 360 365

Asn Asp Val Glu Val Val Lys Asp Gln Phe His Thr His Glu Gly Tyr  
370 375 380

Met Met Asp Leu Thr Ala His Gln Gly Arg Val Gly Asn Ile Leu Gln  
385 390 395 400

Leu Gly Ser Lys Leu Ile Gly Thr Gly Lys Leu Ser Glu Asp Glu Glu  
405 410 415

Thr Glu Val Gln Glu Gln Met Asn Leu Leu Asn Ser Arg Trp Glu Cys  
420 425 430

Leu Arg Val Ala Ser Met Glu Lys Gln Ser Asn Leu His Arg Val Leu  
435 440 445

Met Asp Leu Gln Asn Gln Lys Leu Lys Glu Leu Asn Asp Trp Leu Thr  
450 455 460

Lys Thr Glu Glu Arg Thr Arg Lys Met Glu Glu Glu Pro Leu Gly Pro  
465 470 475 480

Asp Leu Glu Asp Leu Lys Arg Gln Val Gln Gln His Lys Val Leu Gln  
485 490 495

Glu Asp Leu Glu Gln Glu Gln Val Arg Val Asn Ser Leu Thr His Met  
500 505 510

Val Val Val Val Asp Glu Ser Ser Gly Asp His Ala Thr Ala Ala Leu  
515 520 525

Glu Glu Gln Leu Lys Val Leu Gly Asp Arg Trp Ala Asn Ile Cys Arg  
530 535 540

Trp Thr Glu Asp Arg Trp Val Leu Leu Gln Asp Ile Leu Leu Lys Trp  
545 550 555 560

Gln Arg Leu Thr Glu Glu Gln Cys Leu Phe Ser Ser Trp Leu Ser Glu  
565 570 575

Lys Glu Asp Ala Val Asn Lys Ile His Thr Thr Gly Phe Lys Asp Gln  
580 585 590

Asn Glu Met Leu Ser Ser Leu Gln Lys Leu Ala Val Leu Lys Ala Asp  
595 600 605

Leu Glu Lys Lys Gln Ser Met Gly Lys Leu Tyr Ser Leu Lys Gln  
610 615 620

Asp Leu Leu Ser Thr Leu Lys Asn Lys Ser Val Thr Gln Lys Thr Glu  
625 630 635 640

Ala Trp Leu Asp Asn Phe Ala Arg Cys Trp Asp Asn Leu Val Gln Lys  
645 650 655

Leu Glu Lys Ser Thr Ala Gln Ile Ser Gln Ala Val Thr Thr Gln  
660 665 670

Pro Ser Leu Thr Gln Thr Thr Val Met Glu Thr Val Thr Thr Val Thr  
675 680 685

Thr Arg Glu Gln Ile Leu Val Lys His Ala Gln Glu Glu Leu Pro Pro

690

695

700

Pro Pro Pro Gln Lys Lys Arg Gln Ile Thr Val Asp Ser Glu Ile Arg  
705 710 715 720

Lys Arg Leu Asp Val Asp Ile Thr Glu Leu His Ser Trp Ile Thr Arg  
725 730 735

Ser Glu Ala Val Leu Gln Ser Pro Glu Phe Ala Ile Phe Arg Lys Glu  
740 745 750

Gly Asn Phe Ser Asp Leu Lys Glu Lys Val Asn Ala Ile Glu Arg Glu  
755 760 765

Lys Ala Glu Lys Phe Arg Lys Leu Gln Asp Ala Ser Arg Ser Ala Gln  
770 775 780

Ala Leu Val Glu Gln Met Val Asn Glu Gly Val Asn Ala Asp Ser Ile  
785 790 795 800

Lys Gln Ala Ser Glu Gln Leu Asn Ser Arg Trp Ile Glu Phe Cys Gln  
805 810 815

Leu Leu Ser Glu Arg Leu Asn Trp Leu Glu Tyr Gln Asn Asn Ile Ile  
820 825 830

Ala Phe Tyr Asn Gln Leu Gln Gln Leu Glu Gln Met Thr Thr Thr Ala  
835 840 845

Glu Asn Trp Leu Lys Ile Gln Pro Thr Thr Pro Ser Glu Pro Thr Ala  
850 855 860

Ile Lys Ser Gln Leu Lys Ile Cys Lys Asp Glu Val Asn Arg Leu Ser  
865 870 875 880

Gly Leu Gln Pro Gln Ile Glu Arg Leu Lys Ile Gln Ser Ile Ala Leu  
885 890 895

Lys Glu Lys Gly Gln Gly Pro Met Phe Leu Asp Ala Asp Phe Val Ala  
900 905 910

Phe Thr Asn His Phe Lys Gln Val Phe Ser Asp Val Gln Ala Arg Glu  
915 920 925

Lys Glu Leu Gln Thr Ile Phe Asp Thr Leu Pro Pro Met Arg Tyr Gln  
930 935 940

Glu Thr Met Ser Ala Ile Arg Thr Trp Val Gln Gln Ser Glu Thr Lys  
945 950 955 960

Leu Ser Ile Pro Gln Leu Ser Val Thr Asp Tyr Glu Ile Met Glu Gln  
965 970 975

Arg Leu Gly Glu Leu Gln Ala Leu Gln Ser Ser Leu Gln Glu Gln Gln  
980 985 990

Ser Gly Leu Tyr Tyr Leu Ser Thr Thr Val Lys Glu Met Ser Lys Lys  
995 1000 1005

Ala Pro Ser Glu Ile Ser Arg Lys Tyr Gln Ser Glu Phe Glu Glu  
1010 1015 1020

Ile Glu Gly Arg Trp Lys Lys Leu Ser Ser Gln Leu Val Glu His  
1025 1030 1035

Cys Gln Lys Leu Glu Glu Gln Met Asn Lys Leu Arg Lys Ile Gln  
1040 1045 1050

Asn His Ile Gln Thr Leu Lys Lys Trp Met Ala Glu Val Asp Val  
1055 1060 1065

Phe Leu Lys Glu Glu Trp Pro Ala Leu Gly Asp Ser Glu Ile Leu  
1070 1075 1080

Lys Lys Gln Leu Lys Gln Cys Arg Leu Leu Val Ser Asp Ile Gln  
1085 1090 1095

Thr Ile Gln Pro Ser Leu Asn Ser Val Asn Glu Gly Gln Lys  
1100 1105 1110

Ile Lys Asn Glu Ala Glu Pro Glu Phe Ala Ser Arg Leu Glu Thr  
1115 1120 1125

Glu Leu Lys Glu Leu Asn Thr Gln Trp Asp His Met Cys Gln Gln  
1130 1135 1140

Val Tyr Ala Arg Lys Glu Ala Leu Lys Gly Gly Leu Glu Lys Thr  
1145 1150 1155

Val Ser Leu Gln Lys Asp Leu Ser Glu Met His Glu Trp Met Thr  
1160 1165 1170

Gln Ala Glu Glu Glu Tyr Leu Glu Arg Asp Phe Glu Tyr Lys Thr  
1175 1180 1185

Pro Asp Glu Leu Gln Lys Ala Val Glu Glu Met Lys Arg Ala Lys  
1190 1195 1200

Glu Glu Ala Gln Gln Lys Glu Ala Lys Val Lys Leu Leu Thr Glu  
1205 1210 1215

Ser Val Asn Ser Val Ile Ala Gln Ala Pro Pro Val Ala Gln Glu  
1220 1225 1230

Ala Leu Lys Lys Glu Leu Glu Thr Leu Thr Thr Asn Tyr Gln Trp  
1235 1240 1245

Leu Cys Thr Arg Leu Asn Gly Lys Cys Lys Thr Leu Glu Glu Val  
1250 1255 1260

Trp Ala Cys Trp His Glu Leu Leu Ser Tyr Leu Glu Lys Ala Asn  
1265 1270 1275

Lys Trp Leu Asn Glu Val Glu Phe Lys Leu Lys Thr Thr Glu Asn  
1280 1285 1290

Ile Pro Gly Gly Ala Glu Glu Ile Ser Glu Val Leu Asp Ser Leu  
1295 1300 1305

Glu Asn Leu Met Arg His Ser Glu Asp Asn Pro Asn Gln Ile Arg  
1310 1315 1320

Ile Leu Ala Gln Thr Leu Thr Asp Gly Gly Val Met Asp Glu Leu  
1325 1330 1335

Ile Asn Glu Glu Leu Glu Thr Phe Asn Ser Arg Trp Arg Glu Leu  
1340 1345 1350

His Glu Glu Ala Val Arg Arg Gln Lys Leu Leu Glu Gln Ser Ile  
1355 1360 1365

Gln Ser Ala Gln Glu Thr Glu Lys Ser Leu His Leu Ile Gln Glu  
1370 1375 1380

Ser Leu Thr Phe Ile Asp Lys Gln Leu Ala Ala Tyr Ile Ala Asp  
1385 1390 1395

Lys Val Asp Ala Ala Gln Met Pro Gln Glu Ala Gln Lys Ile Gln  
1400 1405 1410

Ser Asp Leu Thr Ser His Glu Ile Ser Leu Glu Glu Met Lys Lys  
1415 1420 1425

His Asn Gln Gly Lys Glu Ala Ala Gln Arg Val Leu Ser Gln Ile  
1430 1435 1440

Asp Val Ala Gln Lys Lys Leu Gln Asp Val Ser Met Lys Phe Arg  
1445 1450 1455

Leu Phe Gln Lys Pro Ala Asn Phe Glu Leu Arg Leu Gln Glu Ser  
1460 1465 1470

Lys Met Ile Leu Asp Glu Val Lys Met His Leu Pro Ala Leu Glu  
1475 1480 1485

Thr Lys Ser Val Glu Gln Glu Val Val Gln Ser Gln Leu Asn His  
1490 1495 1500

Cys Val Asn Leu Tyr Lys Ser Leu Ser Glu Val Lys Ser Glu Val  
1505 1510 1515

Glu Met Val Ile Lys Thr Gly Arg Gln Ile Val Gln Lys Lys Gln  
1520 1525 1530

Thr Glu Asn Pro Lys Glu Leu Asp Glu Arg Val Thr Ala Leu Lys  
1535 1540 1545

Leu His Tyr Asn Glu Leu Gly Ala Lys Val Thr Glu Arg Lys Gln  
1550 1555 1560

Gln Leu Glu Lys Cys Leu Lys Leu Ser Arg Lys Met Arg Lys Glu  
1565 1570 1575

Met Asn Val Leu Thr Glu Trp Leu Ala Ala Thr Asp Met Glu Leu  
1580 1585 1590

Thr Lys Arg Ser Ala Val Glu Gly Met Pro Ser Asn Leu Asp Ser  
1595 1600 1605

Glu Val Ala Trp Gly Lys Ala Thr Gln Lys Glu Ile Glu Lys Gln  
1610 1615 1620

Lys Val His Leu Lys Ser Ile Thr Glu Val Gly Glu Ala Leu Lys  
1625 1630 1635

Thr Val Leu Gly Lys Lys Glu Thr Leu Val Glu Asp Lys Leu Ser  
1640 1645 1650

Leu Leu Asn Ser Asn Trp Ile Ala Val Thr Ser Arg Ala Glu Glu  
1655 1660 1665

Trp Leu Asn Leu Leu Leu Glu Tyr Gln Lys His Met Glu Thr Phe  
1670 1675 1680

Asp Gln Asn Val Asp His Ile Thr Lys Trp Ile Ile Gln Ala Asp

1685	1690	1695
Thr Leu Leu Asp Glu Ser Glu	Lys Lys Lys Pro Gln Gln Lys Glu	
1700 1705	1710	
Asp Val Leu Lys Arg Leu Lys Ala Glu Leu Asn Asp Ile Arg Pro		
1715 1720	1725	
Lys Val Asp Ser Thr Arg Asp Gln Ala Ala Asn Leu Met Ala Asn		
1730 1735	1740	
Arg Gly Asp His Cys Arg Lys Leu Val Glu Pro Gln Ile Ser Glu		
1745 1750	1755	
Leu Asn His Arg Phe Ala Ala Ile Ser His Arg Ile Lys Thr Gly		
1760 1765	1770	
Lys Ala Ser Ile Pro Leu Lys Glu Leu Glu Gln Phe Asn Ser Asp		
1775 1780	1785	
Ile Gln Lys Leu Leu Glu Pro Leu Glu Ala Glu Ile Gln Gln Gly		
1790 1795	1800	
Val Asn Leu Lys Glu Glu Asp Phe Asn Lys Asp Met Asn Glu Asp		
1805 1810	1815	
Asn Glu Gly Thr Val Lys Glu Leu Leu Gln Arg Gly Asp Asn Leu		
1820 1825	1830	
Gln Gln Arg Ile Thr Asp Glu Arg Lys Arg Glu Glu Ile Lys Ile		
1835 1840	1845	
Lys Gln Gln Leu Leu Gln Thr Lys His Asn Ala Leu Lys Asp Leu		
1850 1855	1860	
Arg Ser Gln Arg Arg Lys Lys Ala Leu Glu Ile Ser His Gln Trp		
1865 1870	1875	
Tyr Gln Tyr Lys Arg Gln Ala Asp Asp Leu Leu Lys Cys Leu Asp		
1880 1885	1890	
Asp Ile Glu Lys Lys Leu Ala Ser Leu Pro Glu Pro Arg Asp Glu		
1895 1900	1905	
Arg Lys Ile Lys Glu Ile Asp Arg Glu Leu Gln Lys Lys Lys Glu		
1910 1915	1920	
Glu Leu Asn Ala Val Arg Arg Gln Ala Glu Gly Leu Ser Glu Asp		
1925 1930	1935	

Gly Ala Ala Met Ala Val Glu Pro Thr Gln Ile Gln Leu Ser Asp  
1940 1945 1950

Arg Trp Arg Glu Ile Glu Ser Lys Phe Ala Gln Phe Arg Arg Leu  
1955 1960 1965

Asn Phe Ala Gln Ile His Thr Val Arg Glu Glu Thr Met Met Val  
1970 1975 1980

Met Thr Glu Asp Met Pro Leu Glu Ile Ser Tyr Val Pro Ser Thr  
1985 1990 1995

Tyr Leu Thr Glu Ile Thr His Val Ser Gln Ala Leu Leu Glu Val  
2000 2005 2010

Glu Gln Leu Leu Asn Ala Pro Asp Leu Cys Ala Lys Asp Phe Glu  
2015 2020 2025

Asp Leu Phe Lys Gln Glu Glu Ser Leu Lys Asn Ile Lys Asp Ser  
2030 2035 2040

Leu Gln Gln Ser Ser Gly Arg Ile Asp Ile Ile His Ser Lys Lys  
2045 2050 2055

Thr Ala Ala Leu Gln Ser Ala Thr Pro Val Glu Arg Val Lys Leu  
2060 2065 2070

Gln Glu Ala Leu Ser Gln Leu Asp Phe Gln Trp Glu Lys Val Asn  
2075 2080 2085

Lys Met Tyr Lys Asp Arg Gln Gly Arg Phe Asp Arg Ser Val Glu  
2090 2095 2100

Lys Trp Arg Arg Phe His Tyr Asp Ile Lys Ile Phe Asn Gln Trp  
2105 2110 2115

Leu Thr Glu Ala Glu Gln Phe Leu Arg Lys Thr Gln Ile Pro Glu  
2120 2125 2130

Asn Trp Glu His Ala Lys Tyr Lys Trp Tyr Leu Lys Glu Leu Gln  
2135 2140 2145

Asp Gly Ile Gly Gln Arg Gln Thr Val Val Arg Thr Leu Asn Ala  
2150 2155 2160

Thr Gly Glu Glu Ile Ile Gln Gln Ser Ser Lys Thr Asp Ala Ser  
2165 2170 2175

Ile Leu Gln Glu Lys Leu Gly Ser Leu Asn Leu Arg Trp Gln Glu  
2180 2185 2190

Val Cys Lys Gln Leu Ser Asp Arg Lys Lys Arg Leu Glu Glu Gln  
2195 2200 2205

Lys Asn Ile Leu Ser Glu Phe Gln Arg Asp Leu Asn Glu Phe Val  
2210 2215 2220

Leu Trp Leu Glu Glu Ala Asp Asn Ile Ala Ser Ile Pro Leu Glu  
2225 2230 2235

Pro Gly Lys Glu Gln Gln Leu Lys Glu Lys Leu Glu Gln Val Lys  
2240 2245 2250

Leu Leu Val Glu Glu Leu Pro Leu Arg Gln Gly Ile Leu Lys Gln  
2255 2260 2265

Leu Asn Glu Thr Gly Gly Pro Val Leu Val Ser Ala Pro Ile Ser  
2270 2275 2280

Pro Glu Glu Gln Asp Lys Leu Glu Asn Lys Leu Lys Gln Thr Asn  
2285 2290 2295

Leu Gln Trp Ile Lys Val Ser Arg Ala Leu Pro Glu Lys Gln Gly  
2300 2305 2310

Glu Ile Glu Ala Gln Ile Lys Asp Leu Gly Gln Leu Glu Lys Lys  
2315 2320 2325

Leu Glu Asp Leu Glu Glu Gln Leu Asn His Leu Leu Leu Trp Leu  
2330 2335 2340

Ser Pro Ile Arg Asn Gln Leu Glu Ile Tyr Asn Gln Pro Asn Gln  
2345 2350 2355

Glu Gly Pro Phe Asp Val Gln Glu Thr Glu Ile Ala Val Gln Ala  
2360 2365 2370

Lys Gln Pro Asp Val Glu Glu Ile Leu Ser Lys Gly Gln His Leu  
2375 2380 2385

Tyr Lys Glu Glu Pro Ala Thr Gln Pro Val Lys Arg Lys Leu Glu  
2390 2395 2400

Asp Leu Ser Ser Glu Trp Lys Ala Val Asn Arg Leu Leu Gln Glu  
2405 2410 2415

Leu Arg Ala Lys Gln Pro Asp Leu Ala Pro Gly Leu Thr Thr Ile  
2420 2425 2430

Gly Ala Ser Pro Thr Gln Thr Val Thr Leu Val Thr Gln Pro Val  
2435 2440 2445

Val Thr Lys Glu Thr Ala Ile Ser Lys Leu Glu Met Pro Ser Ser  
2450 2455 2460

Leu Met Leu Glu Val Pro Ala Leu Ala Asp Phe Asn Arg Ala Trp  
2465 2470 2475

Thr Glu Leu Thr Asp Trp Leu Ser Leu Leu Asp Gln Val Ile Lys  
2480 2485 2490

Ser Gln Arg Val Met Val Gly Asp Leu Glu Asp Ile Asn Glu Met  
2495 2500 2505

Ile Ile Lys Gln Lys Ala Thr Met Gln Asp Leu Glu Gln Arg Arg  
2510 2515 2520

Pro Gln Leu Glu Glu Leu Ile Thr Ala Ala Gln Asn Leu Lys Asn  
2525 2530 2535

Lys Thr Ser Asn Gln Glu Ala Arg Thr Ile Ile Thr Asp Arg Ile  
2540 2545 2550

Glu Arg Ile Gln Asn Gln Trp Asp Glu Val Gln Glu His Leu Gln  
2555 2560 2565

Asn Arg Arg Gln Gln Leu Asn Glu Met Leu Lys Asp Ser Thr Gln  
2570 2575 2580

Trp Leu Glu Ala Lys Glu Ala Glu Gln Val Leu Gly Gln Ala  
2585 2590 2595

Arg Ala Lys Leu Glu Ser Trp Lys Glu Gly Pro Tyr Thr Val Asp  
2600 2605 2610

Ala Ile Gln Lys Lys Ile Thr Glu Thr Lys Gln Leu Ala Lys Asp  
2615 2620 2625

Leu Arg Gln Trp Gln Thr Asn Val Asp Val Ala Asn Asp Leu Ala  
2630 2635 2640

Leu Lys Leu Leu Arg Asp Tyr Ser Ala Asp Asp Thr Arg Lys Val  
2645 2650 2655

His Met Ile Thr Glu Asn Ile Asn Ala Ser Trp Arg Ser Ile His

2660	2665	2670
Lys Arg Val Ser Glu Arg Glu Ala Ala Leu Glu Glu		Thr His Arg
2675	2680	2685
Leu Leu Gln Gln Phe Pro Leu Asp Leu Glu Lys Phe		Leu Ala Trp
2690	2695	2700
Leu Thr Glu Ala Glu Thr Thr Ala Asn Val Leu Gln		Asp Ala Thr
2705	2710	2715
Arg Lys Glu Arg Leu Leu Glu Asp Ser Lys Gly Val		Lys Glu Leu
2720	2725	2730
Met Lys Gln Trp Gln Asp Leu Gln Gly Glu Ile Glu		Ala His Thr
2735	2740	2745
Asp Val Tyr His Asn Leu Asp Glu Asn Ser Gln Lys		Ile Leu Arg
2750	2755	2760
Ser Leu Glu Gly Ser Asp Asp Ala Val Leu Leu Gln		Arg Arg Leu
2765	2770	2775
Asp Asn Met Asn Phe Lys Trp Ser Glu Leu Arg Lys		Lys Ser Leu
2780	2785	2790
Asn Ile Arg Ser His Leu Glu Ala Ser Ser Asp Gln		Trp Lys Arg
2795	2800	2805
Leu His Leu Ser Leu Gln Glu Leu Leu Val Trp Leu		Gln Leu Lys
2810	2815	2820
Asp Asp Glu Leu Ser Arg Gln Ala Pro Ile Gly Gly		Asp Phe Pro
2825	2830	2835
Ala Val Gln Lys Gln Asn Asp Val His Arg Ala Phe		Lys Arg Glu
2840	2845	2850
Leu Lys Thr Lys Glu Pro Val Ile Met Ser Thr Leu		Glu Thr Val
2855	2860	2865
Arg Ile Phe Leu Thr Glu Gln Pro Leu Glu Gly Leu		Glu Lys Leu
2870	2875	2880
Tyr Gln Glu Pro Arg Glu Leu Pro Pro Glu Glu Arg		Ala Gln Asn
2885	2890	2895
Val Thr Arg Leu Leu Arg Lys Gln Ala Glu Glu Val		Asn Thr Glu
2900	2905	2910

Trp Glu Lys Leu Asn Leu His Ser Ala Asp Trp Gln Arg Lys Ile  
2915 2920 2925

Asp Glu Thr Leu Glu Arg Leu Gln Glu Leu Gln Glu Ala Thr Asp  
2930 2935 2940

Glu Leu Asp Leu Lys Leu Arg Gln Ala Glu Val Ile Lys Gly Ser  
2945 2950 2955

Trp Gln Pro Val Gly Asp Leu Leu Ile Asp Ser Leu Gln Asp His  
2960 2965 2970

Leu Glu Lys Val Lys Ala Leu Arg Gly Glu Ile Ala Pro Leu Lys  
2975 2980 2985

Glu Asn Val Ser His Val Asn Asp Leu Ala Arg Gln Leu Thr Thr  
2990 2995 3000

Leu Gly Ile Gln Leu Ser Pro Tyr Asn Leu Ser Thr Leu Glu Asp  
3005 3010 3015

Leu Asn Thr Arg Trp Lys Leu Leu Gln Val Ala Val Glu Asp Arg  
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Val Arg Gln Leu His Glu Ala His Arg Asp Phe Gly Pro Ala Ser  
3035 3040 3045

Gln His Phe Leu Ser Thr Ser Val Gln Gly Pro Trp Glu Arg Ala  
3050 3055 3060

Ile Ser Pro Asn Lys Val Pro Tyr Tyr Ile Asn His Glu Thr Gln  
3065 3070 3075

Thr Thr Cys Trp Asp His Pro Lys Met Thr Glu Leu Tyr Gln Ser  
3080 3085 3090

Leu Ala Asp Leu Asn Asn Val Arg Phe Ser Ala Tyr Arg Thr Ala  
3095 3100 3105

Met Lys Leu Arg Arg Leu Gln Lys Ala Leu Cys Leu Asp Leu Leu  
3110 3115 3120

Ser Leu Ser Ala Ala Cys Asp Ala Leu Asp Gln His Asn Leu Lys  
3125 3130 3135

Gln Asn Asp Gln Pro Met Asp Ile Leu Gln Ile Ile Asn Cys Leu  
3140 3145 3150

Thr Thr Ile Tyr Asp Arg Leu Glu Gln Glu His Asn Asn Leu Val  
3155 3160 3165

Asn Val Pro Leu Cys Val Asp Met Cys Leu Asn Trp Leu Leu Asn  
3170 3175 3180

Val Tyr Asp Thr Gly Arg Thr Gly Arg Ile Arg Val Leu Ser Phe  
3185 3190 3195

Lys Thr Gly Ile Ile Ser Leu Cys Lys Ala His Leu Glu Asp Lys  
3200 3205 3210

Tyr Arg Tyr Leu Phe Lys Gln Val Ala Ser Ser Thr Gly Phe Cys  
3215 3220 3225

Asp Gln Arg Arg Leu Gly Leu Leu His Asp Ser Ile Gln Ile  
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Pro Arg Gln Leu Gly Glu Val Ala Ser Phe Gly Gly Ser Asn Ile  
3245 3250 3255

Glu Pro Ser Val Arg Ser Cys Phe Gln Phe Ala Asn Asn Lys Pro  
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Glu Ile Glu Ala Ala Leu Phe Leu Asp Trp Met Arg Leu Glu Pro  
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Gln Ser Met Val Trp Leu Pro Val Leu His Arg Val Ala Ala Ala  
3290 3295 3300

Glu Thr Ala Lys His Gln Ala Lys Cys Asn Ile Cys Lys Glu Cys  
3305 3310 3315

Pro Ile Ile Gly Phe Arg Tyr Arg Ser Leu Lys His Phe Asn Tyr  
3320 3325 3330

Asp Ile Cys Gln Ser Cys Phe Phe Ser Gly Arg Val Ala Lys Gly  
3335 3340 3345

His Lys Met His Tyr Pro Met Val Glu Tyr Cys Thr Pro Thr Thr  
3350 3355 3360

Ser Gly Glu Asp Val Arg Asp Phe Ala Lys Val Leu Lys Asn Lys  
3365 3370 3375

Phe Arg Thr Lys Arg Tyr Phe Ala Lys His Pro Arg Met Gly Tyr  
3380 3385 3390

Leu Pro Val Gln Thr Val Leu Glu Gly Asp Asn Met Glu Thr Pro  
3395 3400 3405

Val Thr Leu Ile Asn Phe Trp Pro Val Asp Ser Ala Pro Ala Ser  
3410 3415 3420

Ser Pro Gln Leu Ser His Asp Asp Thr His Ser Arg Ile Glu His  
3425 3430 3435

Tyr Ala Ser Arg Leu Ala Glu Met Glu Asn Ser Asn Gly Ser Tyr  
3440 3445 3450

Leu Asn Asp Ser Ile Ser Pro Asn Glu Ser Ile Asp Asp Glu His  
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Leu Leu Ile Gln His Tyr Cys Gln Ser Leu Asn Gln Asp Ser Pro  
3470 3475 3480

Leu Ser Gln Pro Arg Ser Pro Ala Gln Ile Leu Ile Ser Leu Glu  
3485 3490 3495

Ser Glu Glu Arg Gly Glu Leu Glu Arg Ile Leu Ala Asp Leu Glu  
3500 3505 3510

Glu Glu Asn Arg Asn Leu Gln Ala Glu Tyr Asp Arg Leu Lys Gln  
3515 3520 3525

Gln His Glu His Lys Gly Leu Ser Pro Leu Pro Ser Pro Pro Glu  
3530 3535 3540

Met Met Pro Thr Ser Pro Gln Ser Pro Arg Asp Ala Glu Leu Ile  
3545 3550 3555

Ala Glu Ala Lys Leu Leu Arg Gln His Lys Gly Arg Leu Glu Ala  
3560 3565 3570

Arg Met Gln Ile Leu Glu Asp His Asn Lys Gln Leu Glu Ser Gln  
3575 3580 3585

Leu His Arg Leu Arg Gln Leu Leu Glu Gln Pro Gln Ala Glu Ala  
3590 3595 3600

Lys Val Asn Gly Thr Thr Val Ser Ser Pro Ser Thr Ser Leu Gln  
3605 3610 3615

Arg Ser Asp Ser Ser Gln Pro Met Leu Leu Arg Val Val Gly Ser  
3620 3625 3630

Gln Thr Ser Asp Ser Met Gly Glu Glu Asp Leu Leu Ser Pro Pro

3635	3640	3645
Gln Asp Thr Ser Thr Gly Leu Glu Glu Val Met Glu Gln Leu Asn 3650 3655 3660		
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Met Arg Glu Asp Thr Met 3680		
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